

## PATENT ABSTRACTS OF JAPAN

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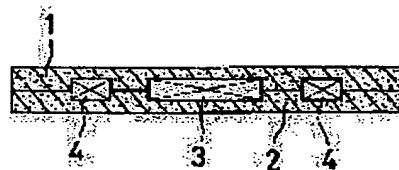
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## (54) NON-CONTACT TYPE IC CARD

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a non-contact type IC card capable of responding to the request of global environment protection, being manufactured at a low cost with high production efficiency and sufficiently securing the mechanical strength of the card.

SOLUTION: By clamping an IC module 3 and a coil 4 for reception and transmission and heating and press-fitting them between the two foamed resin sheets 1 and 2 composed of a resin composition containing a main body resin component composed of copolymer polyester resin in which 10-70% of ethylene glycol component in polyethylene terephthalate is replaced with cyclohexane dimethanol and one or two or more kinds of modifiers selected from synthetic rubber and styrene resin, the IC module 3 and the coil 4 for the reception and the transmission are buried between the piled-up and integrated foamed resin sheets 1 and 2.



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CLAIMS

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[Claim(s)]

[Claim 1] The subject resinous principle which consists of copolymerized polyester resin which permuted 10 - 70% of the ethylene glycol component in polyethylene terephthalate by cyclohexane dimethanol, The foaming resin sheet of two sheets which consists of a resin constituent which comes to contain one sort or two sorts or more of modifiers chosen from synthetic rubber and styrene resin, The noncontact IC card characterized by coming to embed IC module and the coil for reception and transmission between this unified foaming resin sheet while consisting of an IC module and a coil for reception and transmission and setting [ it piles it up and ] and unifying said foaming resin sheet of two sheets mutually.

[Claim 2] The noncontact IC card according to claim 1 with which said resin constituent comes to carry out 2-50 weight section content of the modifier to the subject resinous principle 100 weight section.

[Claim 3] The noncontact IC card according to claim 1 or 2 it is 1.3 to 2.5 times whose expansion ratio of said foaming resin sheet of this.

[Claim 4] A noncontact IC card given in any 1 term of claims 1-3 which said subject resinous principle consists of mixture of said copolymerized polyester resin and polycarbonate resin, and have the weight ratio of copolymerized polyester resin / polycarbonate resin in the range of 20 / 80 - 90/10.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention builds in IC module and the coil for reception and transmission, and relates to the noncontact IC card which receives and transmits by non-contact between external devices.

[0002]

[Description of the Prior Art] In recent years, the application of the plastic card as an information record medium is carrying out sudden expansion, and the need of an IC card with large storage capacity is growing in connection with this as compared with the conventional mag-stripe card. And as this IC card, IC module and the coil for reception and transmission are built in, and there is a noncontact IC card which can receive and transmit by non-contact between external devices.

[0003] Generally the approach of carrying out the laminating of the cover sheet with concealment nature to the front flesh side of this core sheet, and carrying out thermocompression bonding to it conventionally, after trimming the core sheet with the thickness it is thin to manufacture of such a noncontact IC card from a polyvinyl chloride etc. in the necessary configuration, inserting IC module and the coil for reception and transmission in that part and filling a clearance with an adhesive bulking agent is adopted. Moreover, a receipt hollow is established in one side of the card substrate which consists of ABS plastics etc., IC module and the coil for reception and transmission are held in this hollow, and the approach of fixing the covering material which consists of a metal or ABS plastics on it is also proposed (JP,9-123651,A).

[0004]

[Problem(s) to be Solved by the Invention] However, by the general manufacture approach of said conventional noncontact IC card, since a production process became very complicated by the trimming of a core sheet, restoration of an adhesive bulking agent, etc., there was a problem that productive efficiency was bad and manufacture cost was attached highly. Moreover, the card substrate which has a receipt hollow also by said conventional proposal approach had to insert IC module and the coil for reception and transmission in the receipt hollow of this card substrate, when becoming a batch production, since it is necessary to manufacture with injection molding, it had to fix covering material with adhesives etc. further, and had the difficulty that it is operationally complicated and inferior to productive efficiency too.

[0005] If ingredient resin is perceived, furthermore, the above-mentioned vinyl chloride resin It is known generating the hydrogen chloride which will cause acid rain if incineration processing is carried out, and that this hydrogen chloride will contract the life of an incineration processing facility. And recently, it is going to just demand strongly to substitute to a non-vinyl-chloride-resin ingredient that it is also reported that it is the ingredient which can cause dioxin generating from an incinerator, and the environmental preservation and environmental sanitation in earth level should be secured in such a situation. On the other hand, although the above-mentioned ABS plastics can respond to the request of such environmental preservation etc., deburring work was [ that it is easy to produce weld flash ] needed on the occasion of punching at the time of manufacture, and there was a problem that productive efficiency was low. Moreover, there were a mechanical strength and a difficulty of it not being enough, for example, being said that bending reinforcement when a notch enters is low. Furthermore, although the card might be left in the location which is easy to become an elevated temperature under sunshine like the automatic in the car one under stop, it was not what has sufficient thermal resistance which can respond also in such a case.

[0006] It can be cheaply manufactured with high productive efficiency, and sets it as the 1st purpose to offer the noncontact IC card which can moreover fully secure the mechanical strength of the card base material itself while it closes responding to the request of earth environmental preservation in view of an above-mentioned situation, if this invention is possible.

[0007] Moreover, this invention sets it as the 2nd purpose to offer the noncontact IC card with which the outstanding thermal resistance which does not deform under an elevated temperature like the automatic in the car one under stop under sunshine is obtained.

[0008]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, it came to complete a header and this invention for this invention persons being able to manufacture a noncontact IC card cheaply with high productive efficiency wholeheartedly by carrying out heating sticking by pressure on both sides of IC module and the coil for reception and

transmission between the foaming resin sheets of two sheets which consist of a resin constituent of a specific presentation as a result of research, and excelling also in the mechanical strength as a card.

[0009] Namely, the noncontact IC card concerning this invention The subject resinous principle which consists of copolymerized polyester resin which permuted 10 - 70% of the ethylene glycol component in polyethylene terephthalate by cyclohexane dimethanol, The foaming resin sheet of two sheets which consists of a resin constituent which comes to contain one sort or two sorts or more of modifiers chosen from synthetic rubber and styrene resin, It consists of an IC module and a coil for reception and transmission, and while said foaming resin sheet of two sheets is set [ it piles it up and ] and unified mutually, it is characterized by coming to embed IC module and the coil for reception and transmission between this unified foaming resin sheet.

[0010] Since it has compression deformans with a foaming resin sheet peculiar to foaming resin in this noncontact IC card Neither the trimming for holding IC module and the coil for reception and transmission nor formation of a crevice is needed. If heating sticking by pressure is carried out using the foaming resin sheet of the necessary thickness obtained by extrusion molding etc. as it is where IC module and the coil for reception and transmission are only inserted between this foaming resin sheet The foaming resin layer which it puts and is a part is compressed, it dents in an inside side, IC module and the coil for reception and transmission are embedded among both sheets reasonable, and a card-face flesh side serves as a flat side. Thus, the cheap thing which has high productive efficiency is offered.

[0011] Furthermore, since non-vinyl chloride resin is used as a resin ingredient, while being able to respond to the request of environmental preservation, since the specific rate permutation of the ethylene glycol component in polyethylene terephthalate is carried out by cyclohexane dimethanol, weld flash generating at the time of piercing in the shape of a card type is prevented, the deburring work after a punch can be omitted, and it has, and can produce with higher productive efficiency. And mechanical strengths, such as impact strength, improve sharply, without spoiling the above-mentioned weld flash generating prevention effectiveness because the above-mentioned specific modifier contains.

[0012] As for a resin constituent, in the above, it is desirable to come to carry out 2-50 weight section content of the modifier to the subject resinous principle 100 weight section from the point which may make a mechanical strength improve further.

[0013] Moreover, as for the expansion ratio of a foaming resin sheet, it is desirable that they are 1.3 to 2.5 times, and it can fully secure both the compression deformans for embedding IC module and the coil for reception and transmission, and the surface smoothness of a card-face flesh side by considering as this range.

[0014] Furthermore, as for a subject resinous principle, it is desirable that it consists of mixture of copolymerized polyester resin and polycarbonate resin, and the weight ratio of copolymerized polyester resin / polycarbonate resin is in the range of 20 / 80 - 90/10. Since weld flash generating at the time of piercing in the shape of a card type is prevented much more certainly according to concomitant use of polycarbonate resin, it can produce with still higher productive efficiency. Furthermore, since the card which consists of this resin mixture has high thermal resistance moderately, while it can secure the outstanding thermal resistance which does not deform under an elevated temperature like the automatic in the car one under stop under sunshine, it has the advantage which can set the thermocompression bonding temperature of the sheet which printed the pattern etc. beforehand as the range which discoloration of printing ink does not produce.

[0015]

[Embodiment of the Invention] Drawing 1 is the sectional view of the noncontact IC card concerning this invention. It comes to embed IC module (3) and the coil for reception and transmission (4) between the foaming resin sheet (1) of the front flesh side which had piled up this noncontact IC card and was unified, and (2) so that it may illustrate. A deer is carried out, in the embedding parts of IC module (3) in both sheets (3) and (4), and the coil for reception and transmission (4), a foaming resin layer carries out a compression set, and only the part equivalent to the thickness of IC module (3) and the coil for reception and transmission (4) is in

the condition of having dented the inside side.

[0016] In this invention, the resin (henceforth "PETG resin") which permuted 10 - 70% of the ethylene glycol component in polyethylene terephthalate by cyclohexane dimethanol as copolymerized polyester resin which constitutes the subject resinous principle of the resin constituent which forms said foaming resin sheet (1) and (2) is used. In case said substitutional rate pierces in the shape of a card type at less than 10%, it is easy to generate weld flash, and deburring work is needed in this case, and productive efficiency falls. Moreover, when a substitutional rate exceeds 70%, fabrication nature falls, as a result productive efficiency is made to fall. Especially, as for said substitutional rate, considering as 20 - 40% is desirable.

[0017] One sort or two sorts or more of modifiers chosen from synthetic rubber and styrene resin are made to contain to the subject resinous principle 100 weight section in said resin constituent. Thereby, mechanical strengths, such as impact strength, can be raised sharply.

[0018] As for the loadings of this modifier, it is desirable to consider as 2 - 50 weight section to the subject resinous principle 100 weight section. If improvement in mechanical strength sufficient in under 2 weight sections cannot be expected and it blends exceeding 50 weight sections on the other hand, since it will fall rather than the reinforcement obtained with said suitable loadings and cost will be increased to \*\*, it is not desirable. Especially, it is more desirable to consider as 15 - 45 weight section.

[0019] Especially as said synthetic rubber, although not limited, EVA (ethylene-vinylacetate copolymer), EPR (ethylene-propylene rubber), BR (butadiene rubber), PB (polybutadiene), SBR (styrene butadiene rubber), NBR (acrylonitrile-butadiene rubber), etc. are mentioned, for example.

[0020] Especially as said styrene resin, although not limited, ABS plastics (acrylonitrile-butadiene-styrene copolymer), MBS resin (methyl-methacrylate-Butadiene Styrene), MABS resin (methyl-methacrylate-Butadiene Styrene), AAS resin (acrylic rubber-acrylonitrile styrene copolymer), ACS resin (acrylonitrile-chlorinated polyethylene-styrene copolymer), etc. are mentioned, for example.

[0021] In addition, if modifiers other than said synthetic rubber and styrene resin, for example, modifiers, such as PE (polyethylene), are used, in case it pierces about [ that improvement in sufficient mechanical strength is not expectable ] and in the shape of a card type, it will be easy to generate weld flash, and deburring work will be needed, and productive efficiency will be reduced.

[0022] As a foaming agent blended with the resin constituent which constitutes a foaming resin sheet (1) and (2), although each existing thing can be used, since processing of PETG serves as an elevated temperature, the foaming agent of the pyrolysis mold disassembled above 200 degrees C is recommended. Although an azo-blowing agent is generally used by the organic system, the ammonia gas of a minute amount is generated at the time of foaming. Since this promotes hydrolysis of PET, it is not desirable. The inorganic system foaming agent whose generating gas is carbon dioxide gas is used suitably. As this inorganic system foaming agent, organic-acid salts comparatively decomposed at an elevated temperature, such as carbonates, such as sodium bicarbonate, and an oxalate, are used suitably. Moreover, the comparatively small thing of 150 or less mL/g is suitable for a cracked gas yield. Since sheet thickness is thin, if there is much generating gas, a hole vacancy will occur on a sheet and it will become the poor skin. As for the loadings of this foaming agent, it is desirable to consider as the range of 0.5 - 2 weight section to the subject resinous principle 100 weight section. It is because foaming becomes inadequate, there is concern to which a non-foamed object remains when many [ conversely / too ] and this non-foamed object will cause the fall of physical properties, if too few.

[0023] In addition, in this invention, a foaming resin sheet (1) and (2) are not limited to especially the thing manufactured by foaming by the above foaming agents, and they may be manufactured by other technique, for example, machine foaming.

[0024] Moreover, into the aforementioned resin constituent, a foaming accelerator may be blended with a foaming agent in order to generate uniform and fine air bubbles. Although this foaming accelerator should just choose a suitable thing according to the class of foaming agent

to be used, for example to the foaming agent of an azo system, a zinc white, zinc nitrate, etc. can be used suitably. The loadings of a foaming accelerator are comparable as the aforementioned foaming agent, and good.

[0025] It is desirable to make said resin constituent contain polycarbonate resin (henceforth "PC resin") further as a subject resinous principle. The mixture (henceforth "PETG/PC") of such PETG resin and PC resin is because high thermal resistance is shown moderately and it excels also in the punching workability in a sheet gestalt.

[0026] That is, a card may be left in the location which is easy to become an elevated temperature for example, under sunshine like the automatic in the car one under stop. Therefore, although a card is asked for the endurance under an elevated temperature, heat-resistant temperature conventionally sufficient by general-purpose vinyl chloride resin, the above-mentioned ABS plastics, and PET cannot be given. Moreover, if the resin ingredient which, on the other hand, has the very high thermal resistance of PC resin etc. is used, since it is necessary to set up temperature of heating sticking by pressure very highly (for example, PC resin 200 degrees C or more), there is a problem that ink, such as a pattern currently printed on the surface of a sheet, discolors at the time of heating sticking by pressure, and spoils commodity value. However, in aforementioned PETG/PC, since it is comparatively alike and heating sticking by pressure can be carried out at low temperature when thermal resistance higher than general-purpose vinyl chloride resin etc. is obtained, discoloration of the ink on the front face of a sheet is also avoidable.

[0027] Moreover, in this PETG/PC, since weld flash generating at the time of piercing in the shape of a card type is more certainly prevented compared with a PETG resin independent case, deburring work can be omitted and still higher productive efficiency can be secured.

[0028] As for the blending ratio of coal in PETG/PC, it is desirable to set the weight ratio of the former/latter as the range of 20 / 80 - 90/10. If the ratio of PETG resin becomes less than the above-mentioned range, since it is necessary to become near in a PC resin independent case, and to set up the temperature of heating sticking by pressure highly, there is concern which produces discoloration of ink, such as a pattern on the front face of a sheet. Moreover, since thermal resistance will fall if the ratio of PETG resin increases more than the above-mentioned range, it is not desirable. Especially, as for said weight ratio, it is more desirable to set it as the range of 30 / 70 - 85/15, and it is much more desirable to set it as the range of further 50 / 50 - 80/20.

[0029] Into said resin constituent, various additives, such as a pigment, a bulking agent, and an antiblocking agent, can be blended suitably if needed. Although it is usually blended in order that a pigment may give concealment nature to a card base material, especially white pigments are used suitably, it is cheap also in it and titanium oxide excellent in concealment nature is especially more suitable. As for the loadings of this pigment, it is desirable to consider as 1 - 20 weight section to the subject resinous principle 100 weight section. Since concealment nature sufficient in under 1 weight section is not securable, even if it blends exceeding 20 weight sections preferably thru/or on the other hand, since it cannot expect, but it turns in cost quantity up and a mechanical property also falls, a concealment disposition [ that it is balanced ] top is not desirable. It is more desirable to consider as 5 - 15 weight section especially.

[0030] Both a rutile mold and an anatase mold can be used as said titanium oxide. Moreover, it is desirable to use that the mean particle diameter of whose is 0.10-0.5 micrometers. Since distributed stability will fall if it exceeds 0.5 micrometers preferably thru/or on the other hand from an activity sanitary viewpoint that it is easy to disperse in air in less than 0.10 micrometers at the time of an activity for impalpable powder, it is not desirable. It is more desirable to use that whose mean particle diameter is 0.15-0.3 micrometers especially.

[0031] Moreover, in said resin constituent, various kinds of polymers in the range which does not check the property can also be blended.

[0032] Although a deer is carried out, it especially faces producing a noncontact IC card using the aforementioned resin constituent and it is not limited, the following manufacture approach is suitable, for example. First, with an extruding press machine, extrusion molding of said resin constituent is carried out to the shape of a sheet of necessary thickness with foaming, and the

obtained foaming resin sheet (1) and (2) are judged in the magnitude which can extract the card for predetermined number of sheets, i.e., the magnitude corresponding to a press die. And as shown in the drawing 2 (\*\*), one foaming resin sheet (1) is laid on the lower plate (5a) of a heat press machine (5). Two or more sets of IC module (3) and the coil for reception and transmission (4) are laid by predetermined arrangement in every direction on this sheet (1), the foaming resin sheet (2) of another side is piled up on it, in this condition, an up plate (5b) is dropped and heating sticking by pressure is carried out. Thereby, in the part which sandwiched IC module (3) and the coil for reception and transmission (4), as shown in the drawing 2 (\*\*), while carrying out an up-and-down foaming resin sheet (1) and (2) welding unification, in order that a foaming resin layer may carry out a compression set, these IC module (3) and the coil for reception and transmission (4) do not require too much pressure, but are embedded into a foaming resin layer reasonable. By piercing the sticking-by-pressure sheet obtained in this way in the shape of a card type, two or more [ of the noncontact IC cards shown in drawing 1 ] are obtained.

[0033] In addition, what is necessary is to be a phase after judging after said extrusion or in predetermined magnitude etc., and just to perform necessary printing to the field used as the card outside of a foaming resin sheet (1) and (2), when displaying a pattern, an alphabetic character, etc. on a card-face rear face. Or the laminating of the sheet which printed may be carried out to coincidence to both sides at the time of thermal melting arrival.

[0034] Moreover, what is necessary is just to stamp a desired alphabetic character etc. with the marking press called an embosser, after piercing in the shape of a card when displaying an alphabetic character etc. on a card-face rear face in three dimensions with irregularity or performing embossing.

[0035] In addition, although produced by extrusion molding accompanied by foaming by the above-mentioned manufacture approach, as for a foaming resin sheet (1) and (2), what replaced with this, for example, was sheet-ized in the combination of flow casting foaming and roll foaming is usable, and after performing calendering and embossing to the sheet further obtained by these approaches, they can also be used.

[0036] Furthermore, it may be made to perform heating sticking by pressure by the continuous process using a hot calender roll. In this case, what is necessary is to lay IC module (3) and the coil for reception and transmission (4) in an orientation on this sheet (1), to put the sheet (2) of another side by which continuation supply is carried out by that downstream, and for said hot calender roll just to perform heating sticking by pressure continuously by the downstream further, sending one sheet (1) continuously without judging the foaming resin sheet (1) obtained by sheet forming, and (2). While carrying out a deer and being able to supply both sheets (1) and (2) to a heating sticking-by-pressure process continuously from a sheet forming cycle Since a necessary display can also be performed by printing on the way, if the thing of a roll method, the thing which has a both-way actuation device are used as a punching machine made into card type voice after heating sticking by pressure It is also possible to perform the period until it considers as a card product from the sheet forming of both sheets (1) and (2) with the consistent continuation production line.

[0037] The 1.3 to 2.5 times as many range of the expansion ratio of a foaming resin sheet (1) and (2) as this is desirable. This expansion ratio namely, in less than 1.3 times Since compression deformans is inadequate, the pressure of excess joins IC module (3) and the coil for reception and transmission (4) which were inserted between both sheets (1) and (2) at the time of heating compression. Produce breakage and performance degradation or Since there is concern which the embedding parts of IC module (3) and the coil for reception and transmission (4) swell, and loses the commodity value as a noncontact IC card, it is not desirable. Moreover, since the surface smoothness on the front face of a sheet will fall in workability's getting worse and uniform thickness's being hard to be obtained if the above-mentioned expansion ratio becomes larger than 2.5 times conversely, it is not desirable.

[0038] In this invention, the configuration made into the laminating sheet gestalt which are the purposes, such as protection of a card face besides the configuration made into the sheet gestalt of a monolayer as mentioned above, an ornament, and rigid grant, and carried out the laminating of the cover sheet to these outside front faces can also be used for a foaming resin

sheet (1) and (2).

[0039]

[Example] Next, the concrete example of this invention is explained.

[0040] The foaming resin sheet with a thickness of 0.7mm was produced by extrusion molding using the resin constituent blended at a rate which shows the ingredient shown in examples 1-6 and the <examples 1-3 of comparison> table 1 in Table 1. Cut out this sheet in magnitude of 300x400mm, and one of them is laid on the lower plate of a heat press machine. On this foaming resin sheet, two or more sets which consist of an IC module and a coil for reception and transmission are laid by arrangement of vertical 5 train and width 3 train, other one sheet of said foaming resin sheet drops superposition and an up plate on it, and they are 160 degrees C and 20 kgf/cm<sup>2</sup>. It was heated and stuck by pressure. Subsequently, the noncontact IC card with a thickness of 0.76mm was produced by piercing this sticking-by-pressure sheet and piercing to 86x54mm card type voice by the opportunity.

[0041]

[Table 1]

			実施例 1	実施例 2	実施例 3	実施例 4	実施例 5	実施例 6	比較例 1	比較例 2	比較例 3
配合組成 (重量部)	主 体 樹 脂	PETG-A <sup>1)</sup>	100	100	—	—	80	60	100	樹脂 X <sup>4)</sup> 100	樹脂 Y <sup>5)</sup> 100
		PETG-B <sup>2)</sup>	—	—	100	—	—	—	—		
		PETG-C <sup>3)</sup>	—	—	—	100	—	—	—		
		P C	—	—	—	—	20	40	—		
	改質剤	S B R	5	10	—	30	—	20	—	—	—
		M B S	—	—	5	—	30	—	—	—	—
	発泡剤	重炭酸ナトリウム	0.7	1	1.5	—	1	—	1	1	1
		シュウ酸塩	—	—	—	1	—	1.5	—	—	—
	酸化チタン		12	12	12	12	12	8	12	12	12
	発泡倍率 (倍)		1.3	1.5	1.4	1.8	2.3	2.2	1.3	1.3	1.3

1)PETG-A…ポリエチレンテレフタレートにおけるエチレングリコール成分の30%をシクロヘキサジメタノールで置換した共重合ポリエステル樹脂

2)PETG-B…上記置換率が20%の共重合ポリエステル樹脂

3)PETG-C…上記置換率が40%の共重合ポリエステル樹脂

4)樹脂X…上記置換率が3%の共重合ポリエステル樹脂

5)樹脂Y…ポリエチレンテレフタレート (上記置換率が0%)

[0042] It is JIS about the Izod impactive strength of the obtained IC card. While measuring based on K6745, the tightness of weld flash generating at the time of piercing to card type voice, the surface smoothness of a card face, and thermal resistance were evaluated based on the following criterion. The result is shown in Table 2.

[0043] There is no generating of <weld flash generating tightness> weld flash. — “O”

Although weld flash generating arises rarely, the effectiveness from Takao can be secured very few. — “O”

Weld flash generating reduces productive efficiency very mostly. — “x”

It has the surface smoothness in which the <surface smoothness of card face> card face does not have a crack, and the front rear face was excellent. — It is “O.”

It rises to a card face, the section is produced, and it is inferior to surface smoothness. — “\*\*”

A crack occurs in a card face. — “x”

It is JIS about the softening temperature of <heat-resistant evaluation> each IC card. It measured based on K6734 and this softening temperature was made into the index of heat-



resistant evaluation.

[0044]

[Table 2]

	実施例 1	実施例 2	実施例 3	実施例 4	実施例 5	実施例 6	比較例 1	比較例 2	比較例 3
アイソット衝撃 強度 (KJ/m <sup>2</sup> )	8.0	9.4	10.3	75	88	92	4.2	4.0	4.1
バリ発生防止性	○	○	○	○	◎	◎	○	×	×
柔軟温度 (°C)	63	60	62	56	78	92	67	66	63
表面平坦性	○	○	○	○	○	○	○	○	○

[0045] The noncontact IC card of the examples 1-6 of this invention is excellent also in the weld flash generating tightness at the time of piercing to card type voice while surface smoothness is good and excellent in impact strength, so that clearly from the <evaluation result> table 2. Furthermore, with the sheet of examples 5 and 6, thermal resistance improves upwards further and weld flash generating in the case of punching can be prevented more certainly.

[0046] On the other hand, in the examples 1-3 of a comparison which deviate from the range of this invention, sufficient impact strength is not obtained, and it is inferior also to weld flash generating tightness in the examples 2 and 3 of a comparison, and productive efficiency becomes low.

[0047]

[Effect of the Invention] As mentioned above, the noncontact IC card of this invention Since it is the configuration that IC module and the coil for reception and transmission were embedded between the foaming resin sheets of two sheets, Exceptional processing for preparing the hold

parts of IC module and the coil for reception and transmission is not needed for a card base material like before. What can use the sheet obtained by sheet forming, such as extrusion molding, as the above-mentioned foaming resin sheet as it is, has it, and can manufacture it cheaply with high productive efficiency is offered. Furthermore, while being able to respond to the request of environmental preservation by using non-vinyl chloride resin as a resin ingredient, since the specific rate permutation is carried out by cyclohexane dimethanol, weld flash generating at the time of piercing in the shape of a card type can be prevented effectively, as a result the deburring work after a punch can be omitted, and it can produce with still higher productive efficiency. In addition, mechanical strengths, such as impact strength, can be raised sharply, without spoiling the above-mentioned weld flash generating prevention effectiveness, since one sort or two sorts or more of modifiers chosen from synthetic rubber and styrene resin are contained.

[0048] When the resin constituent is carrying out 2-50 weight section content of the modifier to the subject resinous principle 100 weight section, a mechanical strength can be raised further.

[0049] Moreover, while IC module and the coil for reception and transmission are especially embedded reasonable since the compression deformans of the foaming resin sheet of a front flesh side and front-face nature are good when it is 1.3 to 2.5 times the expansion ratio of a foaming resin sheet of this, the card excellent also in surface surface smoothness can be offered.

[0050] When a subject resinous principle consists of mixture of copolymerized polyester resin and polycarbonate resin and the weight ratio of copolymerized polyester resin / polycarbonate resin is in the range of 20 / 80 - 90/10, according to concomitant use of polycarbonate resin, weld flash generating can be prevented much more certainly, and it can produce with still higher productive efficiency. Furthermore, since the card which consists of this resin mixture has high thermal resistance moderately, it does not have discoloration of the pattern which can secure upwards the outstanding thermal resistance which does not deform under an elevated temperature like the automatic in the car one under stop under sunshine, and was printed by the front face, and can offer a high-definition card.

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[Translation done.]

**\* NOTICES \***

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1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

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**DESCRIPTION OF DRAWINGS**

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view of the noncontact IC card concerning this invention.

[Drawing 2] The heating sticking-by-pressure process by the heat press machine in manufacture of a noncontact IC card is shown, (b) is a sectional view before heating sticking by pressure, and (b) is a sectional view at the time of heating sticking by pressure.

[Description of Notations]

1 2 — Foaming resin sheet

3 — IC module

4 — Coil for reception and transmission

## 5 — Heat press machine

[Translation done.]

## \* NOTICES \*

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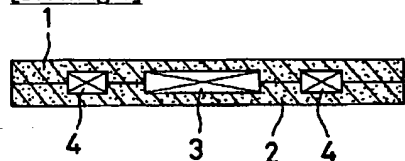
1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\* shows the word which can not be translated.

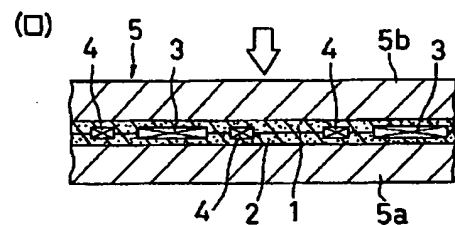
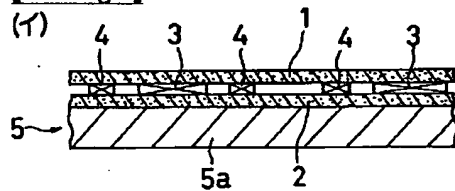
3.In the drawings, any words are not translated.

## DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]